



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/549,621	06/08/2006	Dirk Breidt	000475.00012	8000
22907 7590 01/07/2010 BANNER & WITCOFF, LTD. 1100 13th STREET, N.W. SUITE 1200 WASHINGTON, DC 20005-4051				
EXAMINER				
SONG, MATTHEW J				
ART UNIT		PAPER NUMBER		
1792				
MAIL DATE		DELIVERY MODE		
01/07/2010		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/549,621

Applicant(s)

BREIDT ET AL.

Examiner

MATTHEW J. SONG

Art Unit

1792

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 28-34 is/are allowed.
- 6) ☒ Claim(s) 21-27 and 35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 21-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Leyendecker et al (US 6,268,045) in view of Ali et al ("Promoting secondary nucleation using methane modulations during diamond chemical vapor deposition to produce smoother, harder and better quality films") and Chen et al ("Growth of highly transparent nanocrystalline diamond films and a spectroscopic study of the growth").

Leyendecker et al teaches a tool comprising a fine grained cemented carbide substrate and forming a hard material layer comprising a coating of diamond (Abstract and col 8, ln 45-65). Leyendecker et al also teaches a substrate surface roughness of less than about 0.7 μm and a

surface roughness of the hard material layer being less than about 5 μm , preferably up to 0.3 μm (col 2, ln 30-45), which clearly suggests the surface roughness of the layer is less than the surface roughness of the substrate because 0.3 μm is less than 0.7 μm . Leyendecker et al also teaches any other diamond coating process can be used (col 6, ln 65-67).

Leyendecker et al teaches a diamond layer. However, Leyendecker et al does not teach a nanocrystalline diamond consisting of crystallites of 1-100 nm.

Ali et al teaches a substrate made of silicon and a layer of nanocrystalline diamond (nano-sized polycrystalline diamond grains) (pg 297-98). Ali et al discloses a smoother surface with a roughness of 0.25 μm (pg 298).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Leyendecker et al by using the nanocrystalline diamond taught by Ali et al to produce a diamond with a roughness of only 0.25 μm .

The combination of Leyendecker et al and Ali et al teaches nanocrystalline diamond but is silent to the size of the crystals are between 1 and 100 nm.

In a method of making nanocrystalline diamond, note entire reference, Chen et al teaches diamond films with a grains size of from 4nm to a few hundred nanometers were grown by microwave plasma enhanced chemical vapor deposition (Abstract). Chen et al also teaches the surface roughness is directly related to the grain size of the films deposited at low methane fractions (pg 758).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Leyendecker et al and Ali et al by producing a diamond

with small grain between 5 and 100 nm, as taught by Chen et al, to produce a highly smooth diamond.

Referring to claim 22-23, the combination of Leyendecker et al, Ali et al and Chen et al teaches less than 2 mm ('045 teaches 0.3 μm col 2, ln 30-45).

Referring to claim 24, the combination of Leyendecker et al, Ali et al and Chen et al clearly suggests unordered and untexturized (See Ali et al also teaches polycrystalline diamond (unordered) and is silent to the crystals having a texture, thus clearly suggests untexturized crystals.

Referring to claim 25, the combination of Leyendecker et al, Ali et al and Chen et al teaches heavy duty tools for machining ('045 col 1, ln 5-20).

Referring to claim 26, the combination of Leyendecker et al, Ali et al and Chen et al teaches the growth mode is not the typical columnar type (Ali pg 299).

Referring to claim 27, the combination of Leyendecker et al, Ali et al and Chen et al teaches subsequent layers (See Ali et al which teaches pulsing between different methane concentrations to produce a smooth diamond film (pg 297-98 and Table 2); therefore each subsequent pulse represents an additional layer formed on the nanocrystalline diamond layer.

3. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thorpe et al (US 5,505,158)

Thorpe et al teaches a growth of diamond involving a growth step alternated with an etching step, where the growth step involves a carbon rich growth mixture and the etching step involves an oxygen containing carbonless gas mixture (col 1, ln 15-67). The growth step clearly

Art Unit: 1792

suggests a first operating state. The etching step clearly suggests a second operating state with a lower over-saturation carbon containing atmosphere and a higher oxygen content. Thorpe et al also teaches silicon coated substrates (col 10, ln 1-20). Thorpe et al also teaches CVD (col 12, ln 1-35).

Thorpe et al does not explicitly teach the carbon rich growth mixture is a carbon oversaturation carbon containing atmosphere. Concentration is a result effective variable and Thorpe et al teaches carbon rich for CVD. Therefore, It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Thorpe et al by having an oversaturation concentration of carbon by optimizing the concentration of carbon by conducting routine experimentation.

Allowable Subject Matter

4. Claims 28-34 are allowed.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Gruen et al (US 5,989,511) teaches a substrate comprising a ceramic wherein a nanocrystalline diamond film having grains of a diameter of about 10-300 nm (col 7, ln 1-50 and col 22, ln 7-50).

Phillips et al (US 5,852,341) teaches 250 nm grains of nanocrystalline diamond formed on cemented tungsten carbide substrates (col 4, ln 1-15 and col 7, ln 1-30).

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. SONG whose telephone number is (571)272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song
Examiner
Art Unit 1792

MJS

January 1, 2010

/Robert M Kunemund/
Primary Examiner, Art Unit 1792